Claims

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is as follows:

1. A turbo shaft engine for amplifying the flow rate of an air stream, comprising:

a primary air duct having upstream and downstream ends, said upstream end defining an air intake for receiving an intake flow having a flow rate associated therewith and said downstream end defining an outlet port;

a primary combustion chamber connected to said primary air duct and adapted to receive a portion of said intake flow and to ignite an admixture of fuel and said intake flow portion so as to form an energized motive flow;

a primary inlet passage coupled to said primary air duct and positioned to connect said primary air duct with said primary combustion chamber, said primary inlet passage adapted to receive said intake flow portion;

means positioned between said primary air duct and said primary inlet passage for reversing the flow direction of said intake flow portion;

an exhaust nozzle for discharging said motive flow into said primary air duct slightly downstream of said air intake so as to amplify said flow rate of said intake flow by momentum transfer, whereby to form an amplified intake flow;

an exhaust discharge guide member having a Coanda profile positioned in said primary air duct downstream from said exhaust nozzle for efficiently mixing said motive flow with said intake flow; and

a turbine fan assembly coupled to said outlet port and having a hub with a plurality of blades radially mounted for rotation thereabout, said blades adapted to be rotated

by said amplified intake flow and said motive flow flowing through said outlet port.

2. The turbo shaft engine as in claim 1 wherein said exhaust nozzle includes an annular configuration positioned generally parallel to said exhaust discharge guide member for directing said motive flow tangential to said guide member along said Coanda profile thereof.

3. The turbo shaft engine as in claim 1 further comprising:

a diffuser cone positioned in a downstream portion of said primary air duct having a tapered configuration adapted to direct said motive flow and a remainder of said intake flow toward said outlet port, said diffuser cone defining a plurality of primary inlet ports for communicating said intake flow portion from said primary air duct into said primary inlet passage; and

wherein said reversing means includes an arcuate wall extending radially across a downstream end of said diffuser cone, said wall adapted to reverse the flow direction of air passing through said primary inlet ports from a downstream flow in said primary air duct to an upstream flow in said primary inlet passage, said reversal amplifying the flow rate of said intake flow portion.

4. The turbo shaft engine as in claim 3 further comprising:

a resonance chamber concentrically enveloping said primary inlet passage and extending longitudinally between said primary combustion chamber and said diffuser cone, said resonance chamber defining a first open end in communication with said primary combustion chamber and a second closed end adjacent said diffuser cone;

a transfer port connecting an upstream end of said primary inlet passage with said resonance chamber for communicating said intake flow therebetween; and

whereby combustion within said primary combustion chamber causes a portion of said motive flow to surge back into said resonance chamber and rebound against said second closed end so as to form high and low pressure acoustical waves therein that alternately siphon said intake flow portion from said primary inlet passage into said transport port and amplify the flow rate thereof into said combustion chamber, respectively.

5. The turbo shaft engine as in claim 4 further comprising:

an auxiliary resonance chamber connected to said resonance chamber for receiving said motive flow portion from said resonance chamber; and

a slider coupled to an end of said auxiliary resonance chamber for relative longitudinal movement along said auxiliary resonance chamber for selectively increasing and decreasing a volume of said auxiliary resonance chamber, whereby to regulate a frequency of said high and low pressure acoustical waves in said resonance chamber.

6. The turbo shaft engine as in claim 4 wherein said resonating chamber includes a tubular configuration defining a first plurality of radially spaced apart apertures; and

said turbo shaft engine further comprising a tuning ring axially mounted about said resonating chamber and defining a second plurality of radially spaced apart apertures, said tuning ring being selectively movable between a first configuration in which said first and second plurality of apertures are aligned, a second configuration in which said first and second plurality of apertures are not aligned,

and a third configuration in which said first and second plurality of apertures are partially aligned, whereby to selectively vent said resonating chamber so as to regulate a frequency of said high and low pressure acoustical waves.

7. The turbo shaft engine as in claim 1 wherein said exhaust nozzle is a nozzle ring slidably coupled to said primary combustion chamber for selectably throttling said discharge of said motive flow from said primary combustion chamber into said primary air duct.

8. The turbo shaft engine as in claim 1 further comprising a secondary combustion chamber positioned in said primary air duct downstream from said primary combustion chamber adapted to receive said motive flow and a remainder of said intake flow not received by said primary inlet passage, said secondary combustion chamber adapted to ignite an admixture of fuel and said intake flow remainder and said motive flow so as to form an amplified motive flow.

9. The turbo shaft engine as in claim 8 wherein said secondary combustion chamber is configured to induce a torroidal vortex of said motive flow and said amplified intake flow, whereby to efficiently combust said motive flow and said amplified intake flow using a minimal amount of fuel.

10. A turbo shaft engine for amplifying the flow rate of an air flow, comprising:

a turbine housing defining an interior chamber and an inlet port for receiving an intake flow into said chamber, said intake flow associated with a flow rate;

a turbine blower assembly rotatably mounted in said chamber and having a plurality of blades positioned for rotation by said intake flow;

a primary air duct coupled to said turbine housing and having upstream and downstream ends, said upstream end defining an air intake for receiving said intake flow and said downstream end defining an outlet port;

a primary inlet passage connected to said primary air duct, said primary inlet passage adapted to receive a portion of said intake flow from said primary air duct;

means for reversing the flow direction of said intake flow portion in said primary inlet passage;

a primary combustion chamber coupled to said primary inlet passage for receiving said intake flow portion, said primary combustion chamber adapted to ignite an admixture of fuel and said intake flow portion so as to form a high energy motive flow;

an exhaust nozzle for discharging said motive flow into said primary air duct so as to amplify said flow rate of said intake flow by momentum transfer, whereby to form an amplified intake flow;

an exhaust channel having a first open end coupled to said outlet port for receiving said motive flow and a remainder of said intake flow not received by said primary inlet passage, said exhaust channel adapted to deliver said motive flow and said intake flow remainder into said turbine housing, said blades of said turbine blower assembly being positioned for rotation by said motive flow and said intake flow remainder;

an intake channel comprising:

a first end defining an intake opening adapted to receive said intake flow from the atmosphere;

a second end coupled to said turbine housing and defining an aperture in communication with said inlet port for delivering said air stream into said chamber of said turbine housing;

a combustion pressure tap assembly connecting said primary air duct and said intake opening, for delivering a portion of said motive flow from said primary air duct into said intake opening so as to amplify said intake flow; and

a vane having a Coanda profile positioned in said intake opening for directing said intake flow efficiently into said intake channel.

11. The turbo shaft engine as in claim 10 further comprising an exhaust discharge guide member having a Coanda profile positioned in said primary air duct downstream from said exhaust nozzle for efficiently mixing said motive flow with said intake flow.

12. The turbo shaft engine as in claim 11 wherein said exhaust nozzle includes an annular configuration positioned generally parallel to said exhaust discharge guide member for directing said motive flow tangential to said guide member along said Coanda profile thereof.

13. The turbo shaft engine as in claim 10 further comprising:

a diffuser cone positioned in a downstream portion of said primary air duct having a tapered configuration adapted to direct said motive flow and a remainder of said intake flow toward said outlet port, said diffuser cone defining a plurality of

primary inlet ports for communicating said intake flow portion from said primary air duct into said primary inlet passage; and

wherein said reversing means includes an arcuate wall extending radially across a downstream end of said diffuser cone, said wall adapted to reverse the flow direction of air passing through said primary inlet ports from a downstream flow in said primary air duct to an upstream flow in said primary inlet passage, said reversal amplifying the flow rate of said intake flow portion.

14. The turbo shaft engine as in claim 13 further comprising:

a resonance chamber concentrically enveloping said primary inlet passage and extending longitudinally between said primary combustion chamber and said diffuser cone, said resonance chamber defining a first open end in communication with said primary combustion chamber and a second closed end adjacent said diffuser cone;

a transfer port connecting an upstream end of said primary inlet passage with said resonance chamber for communicating said intake flow therebetween; and

whereby combustion within said primary combustion chamber causes a portion of said motive flow to surge back into said resonance chamber and rebound against said second closed end so as to form high and low pressure acoustical waves therein that alternately siphon said intake flow portion from said primary inlet passage into said transport port and amplify the flow rate thereof into said combustion chamber, respectively.

15. The turbo shaft engine as in claim 14 further comprising:

an auxiliary resonance chamber connected to said resonance chamber for receiving said motive flow portion from said resonance chamber; and

a slider coupled to an end of said auxiliary resonance chamber for relative longitudinal movement along said auxiliary resonance chamber for selectively increasing and decreasing a volume of said auxiliary resonance chamber, whereby to regulate a frequency of said high and low pressure acoustical waves in said resonance chamber.

16. The turbo shaft engine as in claim 14 wherein said resonating chamber includes a tubular configuration and defines a first plurality of radially spaced apart apertures; and

said turbo shaft engine further comprising a tuning ring axially mounted about said resonating chamber and defining a second plurality of radially spaced apart apertures, said tuning ring being selectively movable between a first configuration in which said first and second plurality of apertures are aligned, a second configuration in which said first and second plurality of apertures are not aligned, and a third configuration in which said first and second plurality of apertures are partially aligned, whereby to selectively vent said resonating chamber so as to regulate a frequency of said high and low pressure acoustical waves.

17. The turbo shaft engine as in claim 10 wherein said exhaust nozzle is a nozzle ring slidably coupled to said primary combustion chamber for selectable longitudinal movement relative thereto, whereby to throttle said discharge of said motive flow from said primary combustion chamber into said primary air duct.

18. The turbo shaft engine as in claim 10 further comprising a secondary combustion chamber positioned in said primary air duct downstream from said primary combustion chamber adapted to receive said motive flow and a remainder of said intake flow not received by said primary inlet passage, said secondary combustion chamber adapted to ignite an admixture of fuel and said intake flow remainder and said motive flow so as to form an amplified motive flow.

19. A turbo shaft engine for amplifying the flow rate of an air stream, comprising:

a primary air duct having upstream and downstream ends, said upstream end defining an air intake for receiving an intake flow having a flow rate associated therewith and said downstream end defining an outlet port;

a primary combustion chamber connected to said primary air duct and adapted to receive a portion of said intake flow and to ignite an admixture of fuel and said intake flow portion so as to form an energized motive flow;

a primary inlet passage coupled to said primary air duct and positioned to connect said primary air duct with said primary combustion chamber, said primary inlet passage adapted to receive said intake flow portion;

means positioned between said primary air duct and said primary inlet passage for reversing the flow direction of said intake flow portion;

an exhaust nozzle for discharging said motive flow into said primary air duct slightly downstream of said air intake so as to amplify said flow rate of said intake flow by momentum transfer, whereby to form an amplified intake flow;

a resonance chamber concentrically enveloping said primary inlet passage, said resonance chamber defining a first open end in communication with said primary combustion chamber and a second closed end;

a transfer port connecting an upstream end of said primary inlet passage with said resonance chamber for communicating said intake flow therebetween;

whereby combustion within said primary combustion chamber causes a portion of said motive flow to surge back into said resonance chamber and rebound against said second closed end so as to form high and low pressure acoustical waves therein that alternately siphon said intake flow portion from said primary inlet passage into

said transport port and amplify the flow rate thereof into said combustion chamber, respectively;

an auxiliary resonance chamber connected to said resonance chamber for receiving said motive flow portion from said resonance chamber; and

a slider coupled to an end of said auxiliary resonance chamber for relative longitudinal movement along said auxiliary resonance chamber for selectively increasing and decreasing a volume of said auxiliary resonance, whereby to regulate a frequency of said high and low pressure acoustical waves in said resonance chamber.

20. The turbo shaft engine as in claim 19 further comprising:

a diffuser cone positioned in a downstream portion of said primary air duct having a tapered configuration adapted to direct said motive flow and a remainder of said intake flow toward said outlet port, said diffuser cone defining a plurality of primary inlet ports for communicating said intake flow portion from said primary air duct into said primary inlet passage; and

wherein said reversing means includes an arcuate wall extending radially across a downstream end of said diffuser cone, said wall adapted to reverse the flow direction of air passing through said primary inlet ports from a downstream flow in said primary air duct to an upstream flow in said primary inlet passage, said reversal amplifying the flow rate of said intake flow portion.